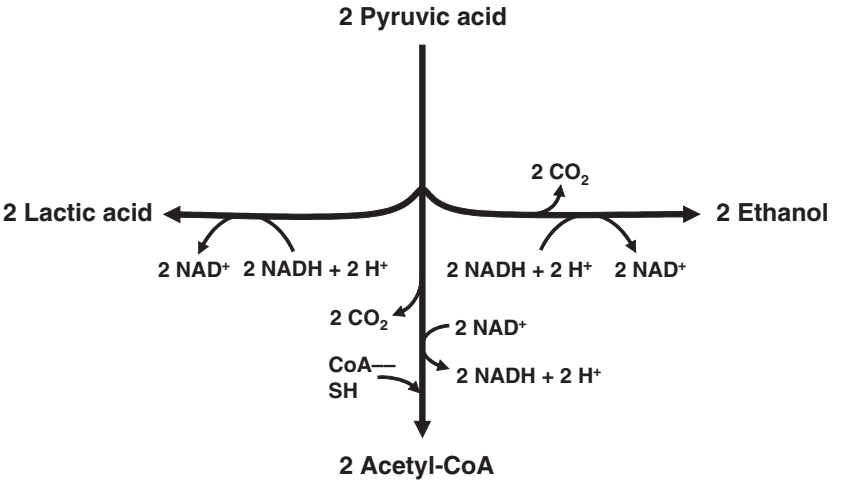

Figure 3.11. Three alternative pathways from pyruvic acid. In anaerobic environments, pyruvic acid is reduced to lactic acid (shown on the left) or to alcohol with the liberation of carbon dioxide (shown on the right). In aerobic conditions, it is decarboxylated, further oxidized, and combined with coenzyme A (CoA-SH) to produce acetyl-CoA, which then enters the citric acid cycle.

to pyruvic acid are common to both alcoholic and lactic acid fermentation and are generally referred to, following Meyerhof's proposal, as *glycolysis*. The pathways diverge in the steps after pyruvic acid (Figure 3.11). Although I have not emphasized the point, researchers along the way named enzymes and typically provided indirect evidence for their operation, so that glycolysis came to be viewed as a complex sequential pathway in which each operation in turn was catalyzed by a specific enzyme and resulted in a product that served as substrate of the next operation. As such, glycolysis became the exemplar of how to understand physiological processes in biochemical terms.

Aerobic Cellular Respiration (1910–1940)

In the nineteenth century, researchers made a sharp distinction between fermentation, which occurred under anaerobic conditions, and aerobic cellular respiration, a process that was often identified with protoplasm and was the focus of speculative accounts by researchers such as Pflüger and Nägeli. As biochemists turned their attention to the oxidation of foodstuffs to carbon dioxide and water, two models competed for attention. Both recognized that